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CONTAINER CORPORATION OF AMERICA, BREWTON PLANT, CONECUH-ESCAMBIA RIVER BASIN STUDY

Environmental Protection Agency
Athens, Georgia

February 1971

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I.

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INTRODUCTION

In August 1969, the Southeast Region of the Federal Water Pollution Control Administration[1/] received a request from the Governor of Florida, for technical assistance in evaluating interstate and intrastate pollution in the Escambia River[2/] and Bay. A water quality study was conducted during September and October 1969. An evaluation of the data collected during the study was presented in a January 1970 report entitled Effects of Pollution on Water Quality, Escambia River and Bay, Florida. The report was presented as evidence of pollution at a January 1970 enforcement conference called to consider the matter of pollution of interstate waters of Escambia River and Bay. The report indicated that waste discharges from Container Corporation of America's paper mill at Brewton, Alabama was the major Alabama source of pollution responsible for water quality degradation occurring in Escambia River and Bay. The Conferees adopted the recommendation that the mill remove 90% of its carbonaceous waste material. This report contains an evaluation of waste treatment efficiencies and related stream conditions and recommends specific acceptable carbonaceous waste loads in the treated effluent.

The cooperation and contribution of Container Corporation of America mill management during the study are gratefully appreciated. Particular acknowledgements are due to personnel of the mill's Technical Engineering Section.

1/ Now the Water Quality Office, Environmental Protection Agency.

2/ The Escambia River is known as the Conecuh River in Alabama.

SUMMARY

Container Corporation of America's (CCA) integrated pulp and paper mill at Brewton, Alabama is in the process of increasing pulping capacity from 900 tons per day to 1050 tons per day. Preceding the expansion is the installation of additional secondary waste treatment facilities. During August 17-28, 1970, prior to activating additional waste treatment units, the Southeast Water Laboratory, Technical Services Division, Federal Water Quality Administration, conducted a 10-day investigation of waste treatment facilities and related stream quality conditions. The study revealed the following:

- The wastewater volume was 32 mgd.
- The untreated 5-day BOD load presently produced at the mill averaged 44,500 pounds per day.
- Treatment facilities removed 81% of the 5-day BOD.
- Daily discharged effluent contained 8,500 pounds of 5-day BOD, which is equivalent to the waste from a population of 49,900.
- Of the 67,500 pounds per day of TOC measured before treatment, 20,800 pounds was discharged daily into the Conecuh River.
- The average TOC reduction was 69%.
- At river stations downstream from the CCA mill, the average dissolved oxygen concentrations ranged from 6.4 to 7.4 mg/l, pH ranged from 6.1 to 7.2, and temperatures varied from 23.5 to 30°C.

CONCLUSIONS

1. In-plant controls are sufficient to reduce the raw 5-day BOD load to 44,500 pounds per day. For the amount of pulp and paper produced, this load is 10,400 pounds per day less than the average 5-day BOD reported for mills in the southern pulp and paper industry.[1/] The volume of wastewater (32 mgd) is 6.6 mgd more than the average from southern Kraft operations.

2. At the time of the survey, treatment facilities were not achieving the 90% BOD and TOC reductions recommended by the Conferees.

3. Water quality standards for dissolved oxygen, pH and temperature were met in the Conecuh-Escambia River downstream from the CCA paper mill.

1/ Survey of Water Utilization and Waste Control Practices in the Southern Pulp and Paper Industry, Water Resources Research Institute, University of North Carolina, June 1970.

RECOMMENDATIONS

1. Recommendations adopted in the 1970 enforcement conference called for a reduction of 90% of the carbonaceous waste load at the Container Corporation mill. The following specific effluent limitations should be added to these recommendations:

- At the present mill pulping capacity of 900 tons per day, the 5-day BOD and TOC loads discharged into the Conecuh River shall not exceed 4,450 and 6,750 pounds per day respectively.
- The effects of the present expansion of the mill's pulping capacity on the above recommendations will be evaluated and reviewed by the Conferees.

2. The investigation revealed that the only treatment the bleach plant and woodyard wastes receives is in the natural ponding system. It is recommended that secondary treatment be provided for these wastes.

STUDY AREA

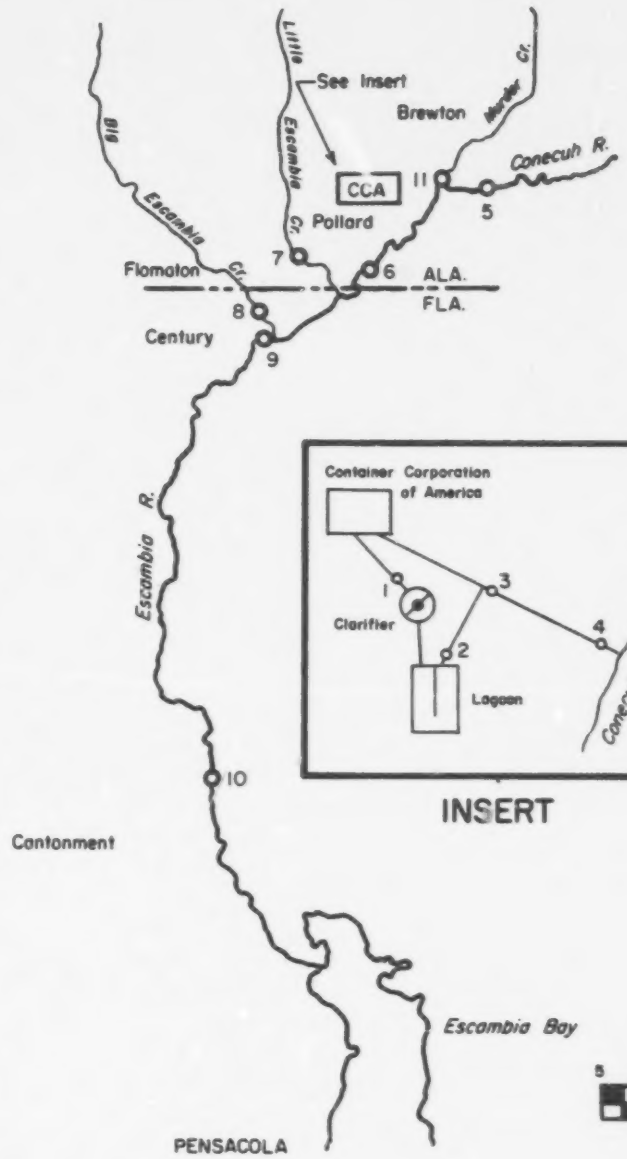
CONTAINER CORPORATION PLANT

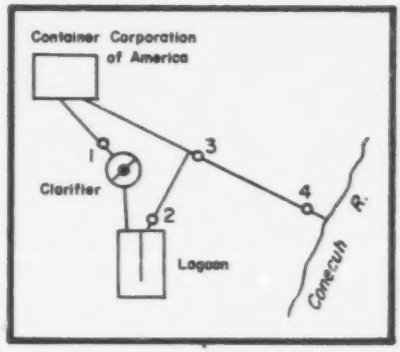
Container Corporation of America's plant at Brewton, Alabama, is a 900 ton per day integrated pulp and paper mill. During the August 1970 study period, the mill produced 32 mgd of wastewater. Eighteen mgd resulted from unbleached pulp and paper operations, while bleach plant and woodyard operations accounted for the remaining 14 mgd. Surface runoff from the small Franklin Mill Creek watershed also contributes to the total wastewater volume leaving the plant area.

At the mill, pulp process wastes are conveyed to a 300-foot diameter mechanical clarifier for settleable solids removal. Liquid oxygen is applied to the clarified pulp process effluent as it flows into a treatment lagoon system (Figure 1). Wastes are retained in the lagoon for an estimated five days of biological degradation and continued settling. Overflow from the lagoon next mixes with untreated bleach plant and woodyard wastes where both are conveyed via Franklin Mill Creek to a series of lakes. Estimated detention time in the lakes is approximately five days. At the final lake, Brewton Lake, a surface mixer aerates the effluent prior to discharge into the Conecuh River (at a point approximately one mile upstream from the Alabama-Florida state line).

Additional secondary treatment facilities to be placed into operation include a 22-acre lagoon with mechanical aerators. The aerated lagoon will precede the existing 140-acre lagoon. The new lagoon was scheduled to become operational in January 1971.

FIGURE 1





INSERT

SCALE IN MILES

5 0 5 10 15

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

LOCATION MAP

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

CONECUH-ESCAMBIA RIVER

The Conecuh-Escambia River rises near Union Springs, Alabama, and terminates its south-southwestward journey in Escambia Bay at Pensacola, Florida. Major tributaries in the vicinity of the Alabama-Florida state line include Little Escambia Creek, Big Escambia Creek and Murder Creek. Little Escambia and Murder Creeks both receive municipal waste discharges. The Escambia River at Century, Florida has an average discharge of 5,952 cfs (37 years of record) with extremes from 596 cfs to 77,200 cfs. The seven-day 10-year low flow is 785 cfs.

The entire river reach is classified for recreation and/or fish and wildlife propagation. The Florida portion of the river from Escambia Bay to the Alabama-Florida state line is classified for both recreation and fish and wildlife uses. All of the river in Alabama is classified for fish and wildlife uses with the reach from Point A Dam to the head of Gantt Lake also designated for recreational use.

STUDY PROGRAM

Following the recommendations of the 1970 enforcement conference on Escambia River and Bay, it was determined that another survey of waste discharges at the Brewton mill was needed to supplement data obtained from the 1969 field studies. The Conferees recommended that Container Corporation of America remove 90% of their carbonaceous waste material. In addition to determining allowable waste discharges, the study reported here was designed to determine the present degree of treatment obtained from existing facilities and to relate waste discharges to existing stream quality.

Eleven sampling stations were established to achieve the study goals (Table 1 & Figure 1). Four sampling stations were selected to evaluate CCA's treatment facilities, and the remaining sampling stations were selected to determine water quality in the Conecuh-Escambia River from a point immediately upstream from the mill to the river's mouth.

TABLE I
SAMPLING STATION NUMBER AND LOCATION
BREWTON PAPER MILL AND
CONECUH-ESCAMBIA RIVER SYSTEM

In-Plant Stations

CC-1	Clarifier influent.
CC-2	Lagoon effluent.
CC-3	Bleach plant, woodyard and lagoon effluent at Franklin Mill Creek Spillway.
CC-4	Brewton Lake discharge approximately 200 yards upstream from junction with Conecuh River.

Conecuh-Escambia River System Stations

CO-5	Conecuh River at Alabama Highway 41 near Brewton, Alabama (R.M. 67.10).
CO-6	Conecuh River one-half mile downstream from Brewton Lake discharge at Pollard boat landing (R.M. 55.90).
LE-7	Little Escambia Creek at U. S. Highway 31.
BE-8	Big Escambia Creek at Escambia County Highway.
E-9	Escambia River at Florida Highway 4 near Century, Florida (R.M. 48.80).
E-10	Escambia River at Florida Highway 184 (R.M. 13.50).
M-11	Murder Creek at CCA process water intake.

STUDY FINDINGS

CONTAINER CORPORATION PLANT

The relative change in BOD and TOC as the waste receives different stages of treatment is reflected in Figures 2, 3 and 4. Existing treatment reduces the untreated 5-day BOD load of 44,500 pounds per day by 81% to 8500 pounds per day. The discharged BOD population equivalent[1/] is 49,900. Total organic carbon is reduced from 67,500 pounds per day to 20,800 pounds, an overall reduction of 69%. The TOC reduction of the pulping wastes routed through the clarifier and the lagoon system alone is 85%, while the corresponding 5-day BOD reduction is 74%. The 5-day BOD reduction across the lakes is about four times greater than the corresponding TOC reduction. Table 2 contains a summary of data from the mill survey.

The Water Resources Research Institute at the University of North Carolina has recently issued a publication which includes a survey of the amount of waste and wastewater generated per ton of production for different types of mills in the southern pulp and paper industry. This publication shows the average volume of wastewater per ton of product is 18,500 gallons for unbleached product and 38,000 gallons for bleached product. The Brewton Mill presently produces approximately 900 tons per day of pulp. Approximately half of this production is bleached. Wastewater flow during the survey was about 32 mgd. The average for southern Kraft operation is 25.4 mgd for a 900 ton plant.

[1/] One population equivalent = 0.17 pounds per capita per day.

FIGURE 2

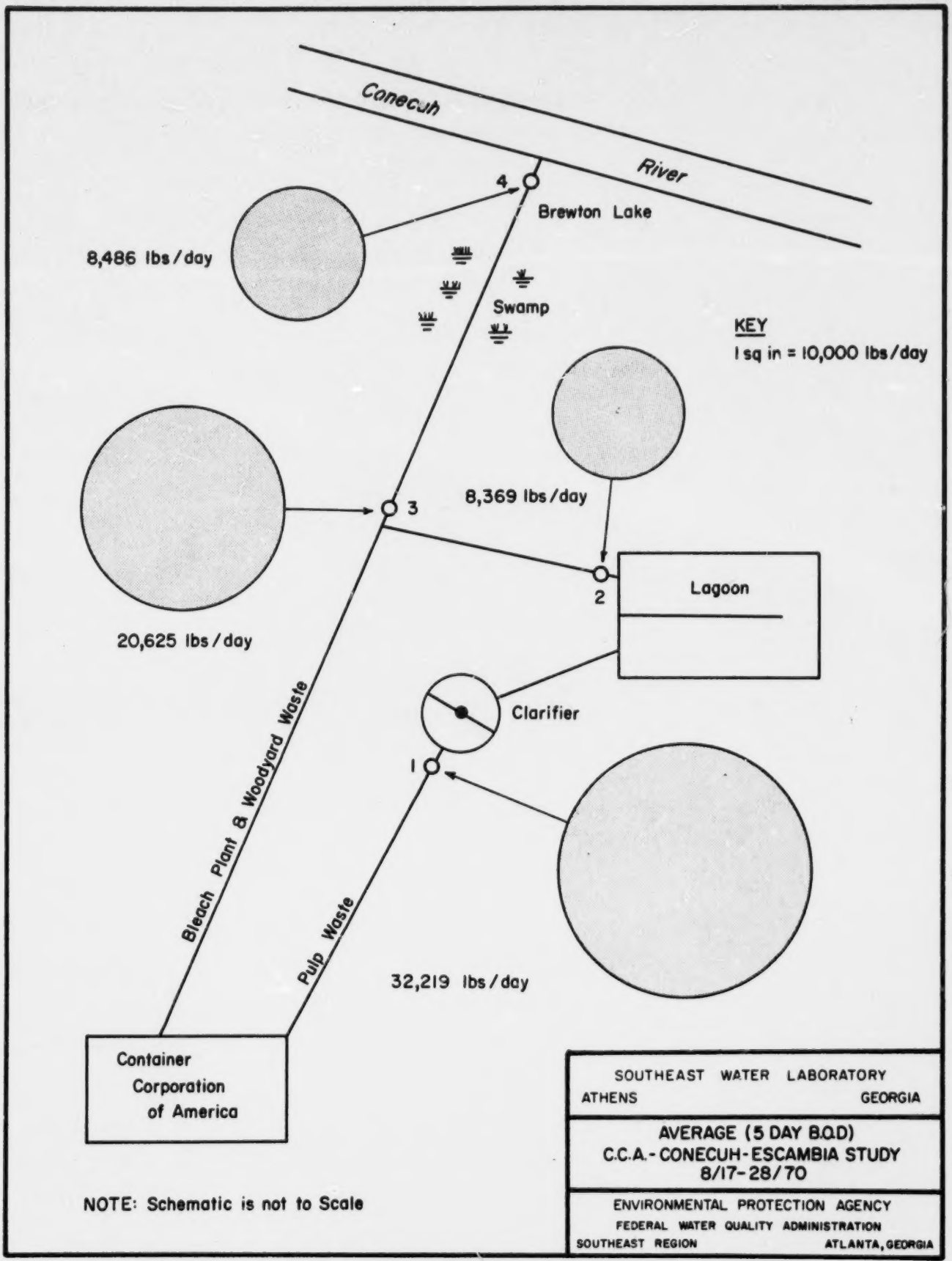

Conecuh
River
4
Brewton Lake
8,486 lbs/day
Swamp
KEY
1 sq in = 10,000 lbs/day
8,369 lbs/day
3
20,625 lbs/day
2
Lagoon
Clarifier
1
Bleach Plant & Woodyard Waste
Pulp Waste
32,219 lbs/day
Container Corporation of America
NOTE: Schematic is not to Scale
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA
AVERAGE (5 DAY B.O.D)
C.C.A.-CONECUH-ESCAMBIA STUDY
8/17-28/70
ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 3

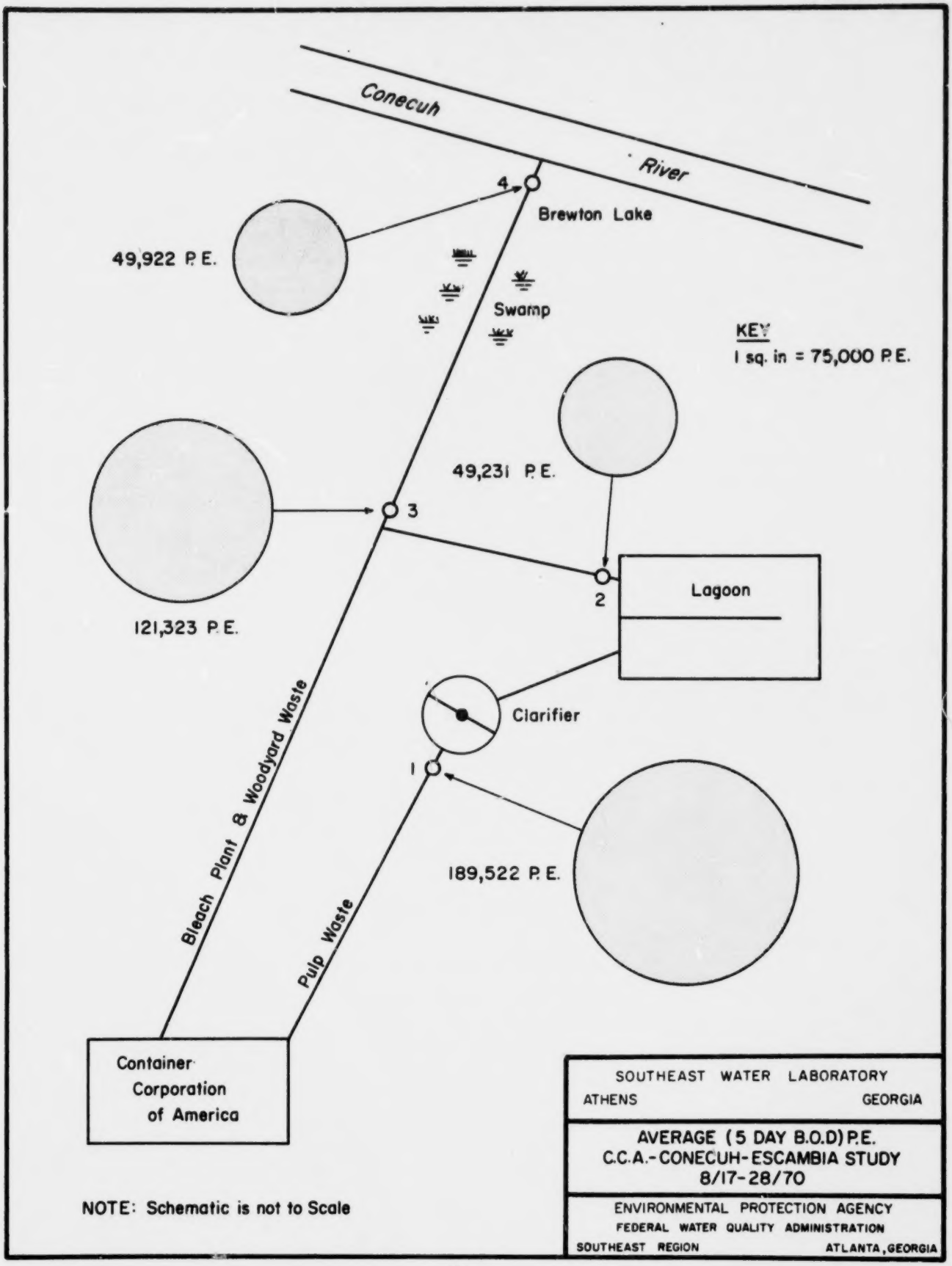

Conecuh
River
4
Brewton Lake
49,922 P.E.
Swamp
KEY
1 sq. in = 75,000 P.E.
49,231 P.E.
3
121,323 P.E.
2
Lagoon
Clarifier
1
189,522 P.E.
Bleach Plant & Woodyard Waste
Pulp Waste
Container Corporation of America
NOTE: Schematic is not to Scale
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA
AVERAGE (5 DAY B.O.D) P.E.
C.C.A.-CONECUH-ESCAMBIA STUDY
8/17-28/70
ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 4

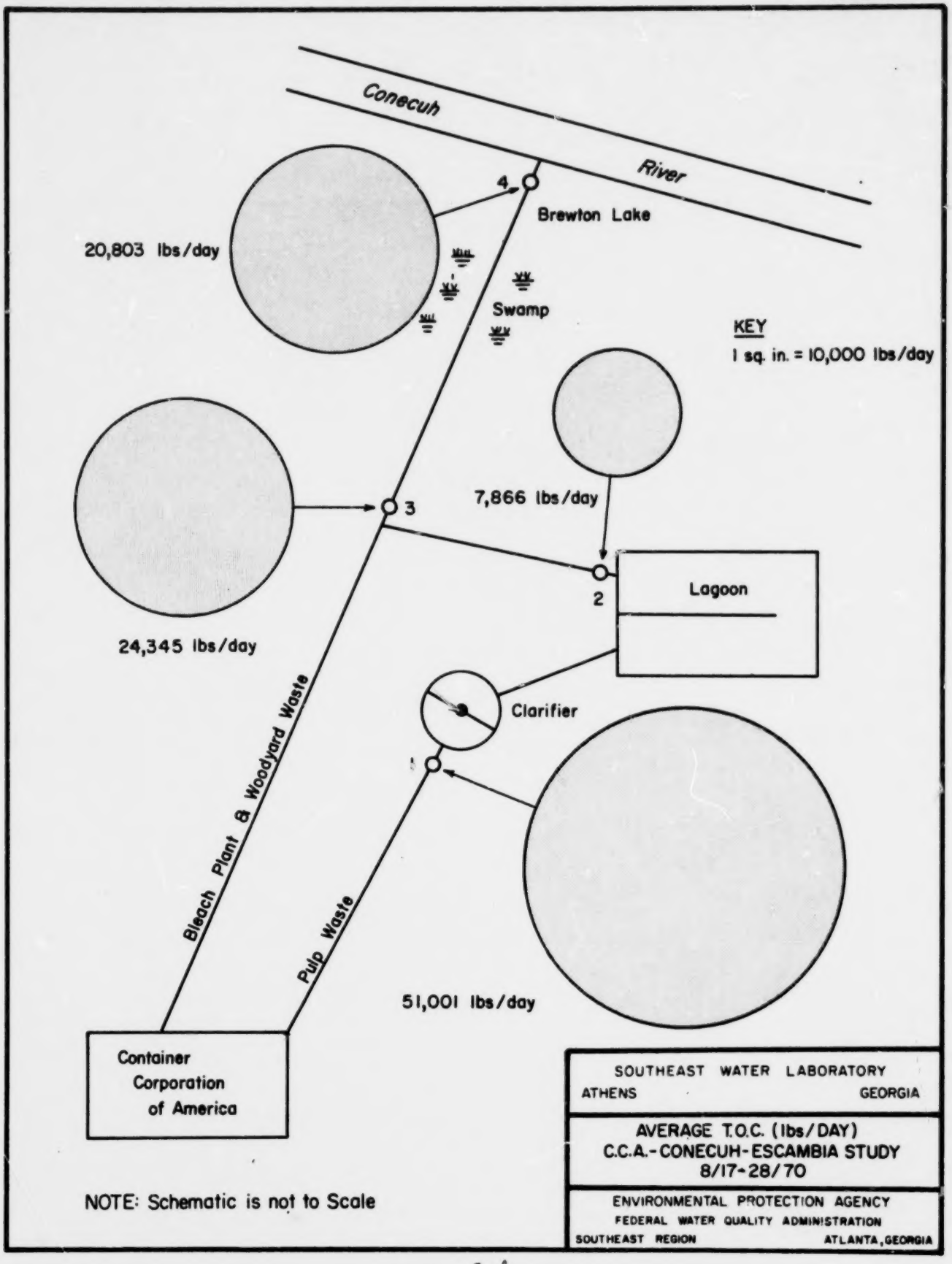

Conecuh
River
4
Brewton Lake
20,803 lbs/day
Swamp
KEY
1 sq. in. = 10,000 lbs/day
7,866 lbs/day
3
2
Lagoon
24,345 lbs/day
Clarifier
Bleach Plant & Woodyard Waste
Pulp Waste
51,001 lbs/day
Container Corporation of America
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA
AVERAGE T.O.C. (lbs/DAY)
C.C.A.-CONECUH-ESCAMBIA STUDY
8/17-28/70
ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA
NOTE: Schematic is not to Scale

TABLE 2

Waste Treatment Survey Data - Brewton Mill

Container Corporation of America

August 17-28, 1970

Station No. & Location	Range	Flow (cfs)	Water Temp. (°C)	pH (units)	Color	BOD_5 (mg/l)	TOC (mg/l)	Residue Non-Filterable (mg/l)	Residue Volatile (mg/l)
CC-1	Max	30.4	42.8	9	400	360	820	700	520
Clarifier In-	Min	30.4	29.0	7.1	150	90	66	38	21
fluent	Mean	30.4	41.1	8.0	250	197	312	263	187
CC-2	Max	27.9	35.0	7.5	250	81	75	120	95
Lagoon	Min	27.9	26.5	6.6	200	34	40	8	6
Effluent	Mean	27.9	29.3	7.2	215	56	52	55	34
CC-3									
Bleach	Max	93	35.5	7.2	500	73	120	50	22
plant,	Min	62	24.5	5.3	200	23	31	31	11
lagoon &	Mean	77.5 1/	29.5	6.3	390	51.2	62	37	16
woodyard effluent									
CC-4	Max	103.9	30.5	7.2	500	28	55	28	15
Brewton Lake	Min	77.5	24.5	6.0	300	12	22	14	1
Discharge	Mean	89.2 1/	27.8	6.6	417	18.2	46	20	9

1/ Includes unpolluted flow from Franklin Mill Creek.

The Water Resources Research Institute publication shows average 5-day BOD loads before treatment for unbleached and bleached pulp and paper mills to be 43 and 79 pounds per ton of production respectively. Using these values and present mill production figures, the calculated load for the CCA mill is 54,900 pounds per day of 5-day BOD. The present raw load generated is 10,400 pounds per day less than the average load from southern Kraft operations.

CONECUH-ESCAMBIA RIVER QUALITY

Conecuh-Escambia River stream data collected as part of the study (see Table 3) showed that the average temperature and pH values of 26.9°C and 6.9 units at Pollard Landing (1/2 mile downstream from plant discharge) were very close to background values of the Conecuh River upstream from the CCA mill. Average dissolved oxygen (DO) concentration at all river stations was greater than or equal to 6.4 mg/l. The minimum DO concentration observed in the river was 5.8 mg/l at the Highway 184 bridge (Station E-10).

The TOC concentrations in the river were higher during the second week of the survey -- probably because of increased runoff. At Pollard Landing, an average TOC concentration of 8.6 mg/l was found -- 28% greater than at station CO-5 (assumed to exemplify background conditions). The Escambia River near the state line (E-9) had a mean TOC of 9.7 mg/l. Thirty-five miles downstream -- Florida Highway 184 bridge -- the average TOC was 8.8 mg/l, no significant change. The average TOC concentrations for river stations are shown in Figure 5.

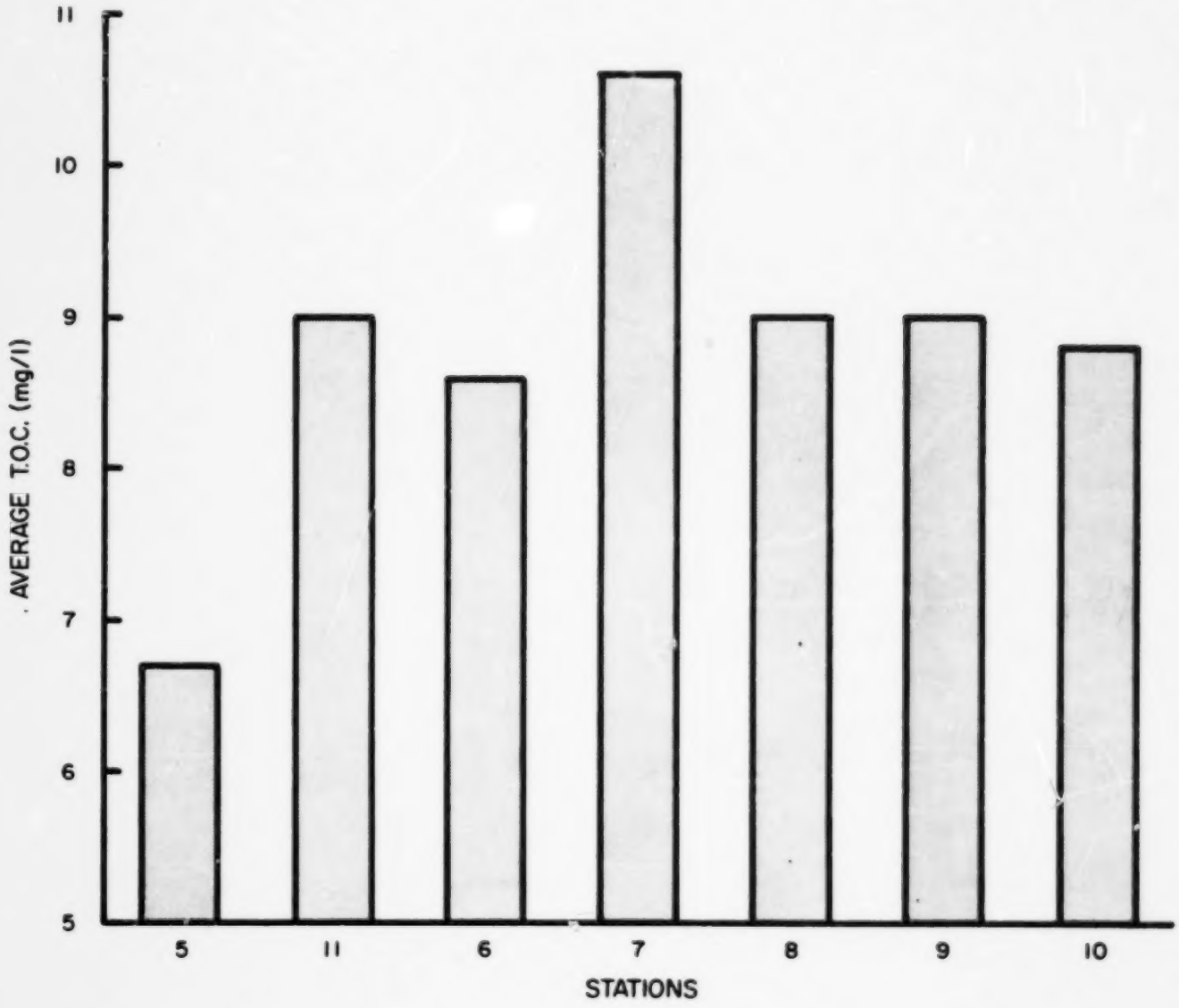
TABLE 3

Water Quality Survey Data

Conecuh-Escambia River System

Station No. & Location	Range	Flow (cfs)	DO (mg/l)	Water Temp. (°C)	pH (units)	BOD_5 (mg/l)	TOC (mg/l)	Residue Non-Filterable (mg/l)	Residue Volatile (mg/l)
CO-5	Max	-	8.6	30	7.2	2.7	11	40	14
Conecuh River	Min	-	7.3	24	6.5	0.2	4	10	1
@ Ala. Hwy 41	Mean	-	7.9	26.9	6.8	1.5	6.7	23	5
CO-6									
Conecuh River	Max	-	7.8	30	7.2	3.0	15	36	8
½ mi. below	Min	-	7.0	24	6.5	1.5	6	8	1
Brewton Lake at Pollard Landing	Mean	-	7.4	26.7	6.8	2.2	8.6	23	4
LE-7									
Little Escambia	Max	-	8.9	27	6.5	1.3	17	57	9
Ck @ U.S. 31	Min	-	6.5	21.5	4.1	0.3	5	5	1
	Mean	-	7.7	23.6	5.1	0.9	10.6	16	4
BE-8									
Big Escambia Cr	Max	-	7.8	28	6.6	1.9	27	24	11
@ Escambia Co.	Min	-	6.0	21.5	5.4	0.7	4	9	1
Road	Mean	-	7.2	24.7	5.7	1.2	9.0	15	6
E-9	Max	6350	7.6	29	6.9	4.2	14	43	9
Escambia Rv. @	Min	3170	6.7	23.5	6.1	1.1	6	15	1
Fla. Hwy 4	Mean	4760	7.2	26.3	6.5	1.6	9.2	22	4
E-10	Max	6350	7.2	29	6.8	3.9	17	22	6
Escambia Rv @	Min	3170	5.8	24	6.1	0.8	5	3	1
Fla. Hwy 184	Mean	4680	6.4	26.5	6.4	1.6	8.8	15	3
M-11									
Murder Ck @	Max	-	8.2	26	7.1	1.9	14	51	10
CCA Process	Min	-	7.4	22	6.3	0.3	5	5	1
Water Intake	Mean	-	7.9	23.5	6.6	1.3	8.9	23	5

FIGURE 5
AVERAGE T.O.C. (mg/l)
C.C.A.-CONECUH-ESCAMBIA STUDY
8/17-28/70



APPENDIX A

ACKNOWLEDGEMENT

The cooperation and resources of the Container Corporation contributed to a successful study. Sincere thanks are extended to John Fay, Technical Superintendent; Rudy Yuhasz, Shift Supervisor; William Brantly, Project Engineer; the remaining members of the technical section; and to other Brewton plant personnel for their support.

Southeast Water Laboratory's field personnel were:

Dennis Cafaro - Sanitary Engineer

Pat Lawless - Chemist

Tom Sack - Technician

Roy Wiemert - Technician

APPENDIX B

SAMPLING PROCEDURE

CCA and FWQA personnel cooperated in a 10-day split sampling schedule from August 17-28, 1970. Composite samples were collected at station CC-1, while all others were grab samples collected twice per day -- one set in the morning, the second set in the afternoon. Samples from stations CC-1, CC-2, CC-3 and CC-4 were routinely analyzed for temperature, pH, 5-day BOD, and TOC. Station CC-4 samples were also analyzed for DO. Volatile and total suspended solids were determined only on the morning set.

All river and tributary station samples were analyzed for DO, temperature, pH, 5-day BOD and TOC. The morning set was additionally analyzed for total and volatile suspended solids.

Samples were obtained using a DO dunker sampler at all river and tributary stations. The DO bottle was removed from the sampler and taken through the second step of the modified Winkler method in the field. The remaining excess water was then measured for temperature and poured into a two-liter container. The container and the fixed DO sample were placed into an ice chest until the entire sample run was completed. Samples were then transported to a mobile lab. Samples from in-plant stations were obtained with a bucket-type sampling device.

Dissolved oxygen, pH and five-day BOD were determined in the mobile lab. The TOC and total and volatile suspended solids were returned to the Southeast Water Laboratory, Athens, Georgia for analysis.

APPENDIX C

ANALYTICAL METHODS

The following analytical methods were used by FWQA personnel:

DO - Modified Winkler with Full-Bottle Technique - "FWPCA Methods for Chemical Analysis of Water and Wastes," November 1969.

TOC - Single Channel Instrument, Dow Beckman Carbonaceous Analyzer, "FWPCA Methods for Chemical Analysis of Water and Wastes," November 1969.

Five-day BOD - "FWPCA Methods for Chemical Analysis of Water and Wastes," November 1969. (Using the Conecuh River water at station CO-5 for dilution of in-plant samples).

pH - Laboratory Instrument meter.

Solids - Total suspended solids, "FWPCA Methods for Chemical Analysis of Water and Wastes," November 1969; total volatile suspended solids, "Standard Methods for the Examination of Water and Wastewater," 12th Edition, 1965.

APPENDIX D

METEOROLOGY AND STREAMFLOW

The average monthly temperature during the survey was 1°F below normal, but precipitation was 2.09 inches above normal.[1/] The first week of study was warm and only isolated scattered showers occurred. Three days of heavy rainfall fell the second week. Average flows in the Escambia River at the Century, Florida, U.S.G.S. gage were:

August 17-21	3,169 cfs
August 24-28	6,352 cfs

Flow values for in-plant stations were provided by CCA:

Sampling Point	Weekly Average (mgd) 8/17-21	8/24-28
CC-1, Clarifier Inlet	19.6	19.6
CC-2, Oxidation Pond Outlet	18.0	18.0
CC-3, Spillway	40.0	60.0
CC-4, Brewton Lake	50.0	67.0

[1/] U. S. Department of Commerce, ESSA, Climatological Data, Alabama, August 1970. Vol. 76, No. 8.